KENWOOD

DISTORTION METER

# HM-250

# SERVICE MANUAL

KENWOOD CORPORATION

## WARNING

**The following instructions are for use by qualified personnel only. To avoid electric shock, do not perform any servicing other than contained in the operating instructions unless you are qualified to do so.**

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# ADJUSTMENT

To obtain the best performance, periodically calibrate the unit. Sometimes, only one mode need be calibrated, while at other times, all modes should be calibrated. When one mode is calibrated, it must be noted that the other modes may be affected. When calibrating all modes, perform the calibration in the specified sequence.
The following calibration required an accurate measuring instrument and an insulated adjusting flat blade screwdriver. If they are not available, contact your dealer. For optimum adjustment, turn the power on and warm up the unit sufficiently (more than 30 minutes) before starting.
Before calibrating the unit, check the power supply voltage.

## TEST EQUIPMENT REQUIRED

The following instrument or their equivalent should be used for making adjustment.

| Test Equipment | Model | Minimum Specification |
|---|---|---|
| Calibrator (Fluke) | 5101B | • 400 Hz or 1 kHz<br>• 3 mV to 3 V ±0.2% |
| Oscillator (Tektronix) | SG505 | • 10 Hz to 200 kHz<br>• 3 mV to 3.2 V<br>• Frequency response: ±0.1 dB<br>• Distortion: 20 Hz to 20 kHz ≦0.005% |
| Counter (KENWOOD) | FC-758 | • 20 Hz to 20 kHz ≦0.1% |
| Oscilloscope (KENWOOD) | CS-4025 | • 10 MHz, 10 mV/DIV |

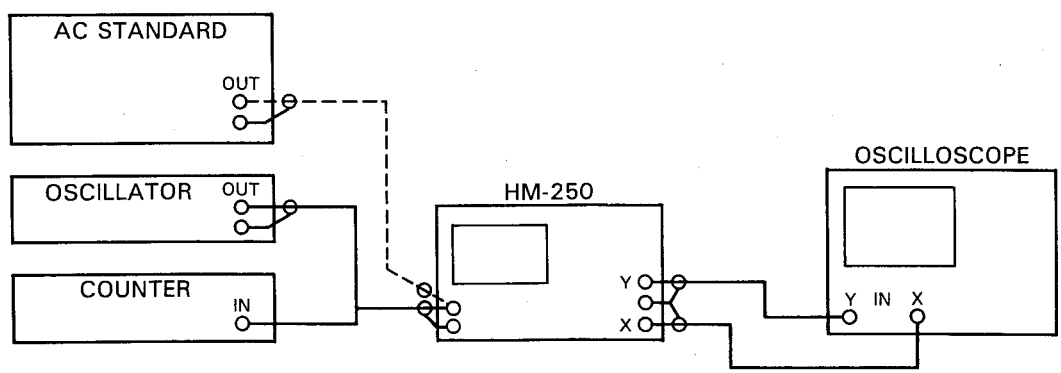



**Fig. 1 Connection Diagram**

# ADJUSTMENT

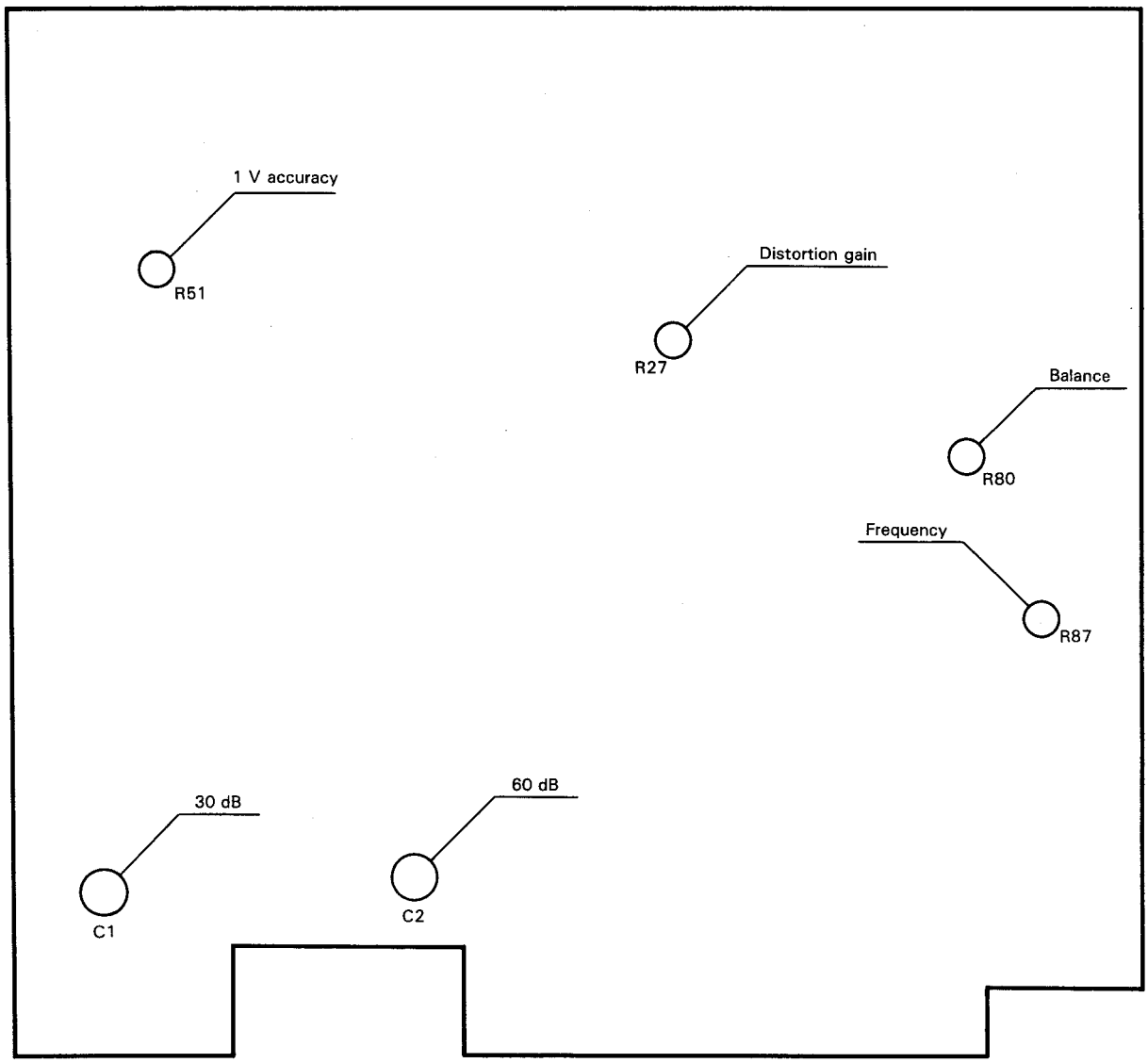
Complete sync | Incomplete frequency | Incomplete frequency & balance | Incomplete balance

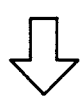
**Fig. 2 Lissajou's waveform**

| Item | Adjustment R (C) | Test Equipment | Procedure |
|---|---|---|---|
| VM meter 1 V accuracy | R51 | Standard AC voltage generator 400 Hz or 1 kHz, 1 V ±0.2%. | • FUNCTION: VM<br>• ATT: 30 dB<br>• RANGE: 1 V<br>• Adjust R51 so that the meter reads 1 V (100%). |
| VM meter frequency characteristic | C1 | Oscillator 1 kHz, 200 kHz 0.1 V | • ATT: 30 dB<br>• RANGE: 0.1 V<br>• With 1 kHz, 100 mV input, fine-adjust the oscillator level so that the meter reads 100 mV (100%).<br>• With 200 kHz input, adjust C1 so that the meter reads 97 mV (97% = −0.3 dB). |
| VM meter frequency characteristic | C2 | Oscillator 1 kHz, 200 kHz 3.2 V | • ATT: 60 dB<br>• RANGE: 3 V<br>• With 1 kHz, 3.2 V input, fine-adjust the oscillator level so that the meter reads 3.16 V (100%).<br>• With 200 kHz input, adjust C2 so that the meter reads 3.07 V (97% = −0.3 dB). |
| DM meter CAL/DM gain | R27 | Oscillator 1 kHz, 0.1 V | • ATT: 0 dB<br>• Adjust CAL and SENSITIVITY so that the meter reads 100%.<br>• FUNCTION: DM, Dial: 2, MULTI: 100, RANGE: 100%<br>• Adjust R27 so that the meter reads 100%.<br>Switch CAL and DM alternately and check that the readings are the same. |
| DM meter frequency | R87 | Oscillator 1 kHz ±0.1%, 0.1 V Counter | • ATT: 0 dB<br>• Adjust CAL and SENSITIVITY so that the meter reads 100%.<br>• FUNCTION: DM, Dial: 20, FINE: Center, MULTI: 100, RANGE: 100%<br>• Adjust R87 to minimize the meter reading (≤5%).<br>Ensure that the Lissajou's waveform is closed. Small inclination is acceptable. |
| DM meter frequency | R108 | Oscillator 200 Hz ±0.1%, 0.1 V Counter | • ATT: 0 dB<br>• Adjust CAL and SENSITIVITY so that the meter reads 100%.<br>• FUNCTION: DM, Dial: 2, FINE: CW, MULTI: 100, RANGE: 100%<br>• Adjust R108 to minimize the meter reading (≤5%).<br>Ensure that the Lissajou's waveform is closed. Small inclination is acceptable. |
| DM meter balance | R80 | Oscillator 2 kHz, 0.1 V | • ATT: 0 dB<br>• Adjust CAL and SENSITIVITY so that the meter reads 100%.<br>• FUNCTION: DM, Dial: 2, MULTI: 1k, RANGE: 100%<br>• Adjust FINE so that the meter reads 10% or less, and set RANGE to 0.1%.<br>• Adjust R80 to make the Lissajou's waveform flat.<br>• Then, return R80 in the clockwise direction slightly (by about one trimmer scale). |

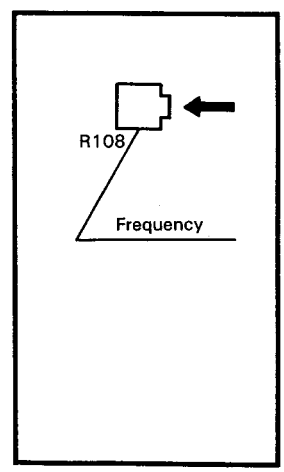
# ADJUSTMENT

## MAIN UNIT (W02-2081-08)



FRONT



# PARTS LIST

## HM-250 UNIT

### Y88-1470-00

| REF.NO | PARTS NO | NAME & DESCRIPTION |
|---|---|---|
| | A01-1229-02 | CASE |
| | A01-1230-02 | CHASSIS |
| | A13-0948-13 | FRAME,SIDE |
| | A21-1169-02 | DECORATIVE PANEL |
| | A22-0881-02 | SUB PANEL |
| | A83-0001-02 | REAR PANEL |
| | B01-0705-03 | ESCUTCHEON |
| | B20-0934-14 | DIAL SCALE |
| | B42-3699-04 | SERIAL NO. PLATE |
| | B63-0005-00 | INSTRUCTION MANUAL;ENG./JAP. |
| | D21-0928-04 | EXTENTION SHAFT |
| | D22-0501-04 | JOINT & COUPLING |
| | E18-0365-05 | AC SELECTOR WITH 6X30MM FUSE |
| | E18-0366-15 | AC SELECTOR WITH 5X20MM FUSE |
| | E30-1644-15 | BS POWER CORD |
| | E30-1818-05 | JIS POWER CORD SET |
| | E30-1819-05 | CEE POWER CORD SET |
| | E30-1820-05 | UL/CSA POWER CORD SET |
| | E30-1821-05 | SAA POWER CORD SET |
| | F05-2516-05 | FUSE(6X30MM) 0.25A |
| | F05-2518-05 | FUSE(5X20MM) 250MAT |
| | F05-5013-05 | FUSE(6X30MM) 0.5A |
| | H10-2851-02 | FOAMED STYRENE PAD(FRONT) |
| | H10-2852-02 | FOAMED STYRENE PAD(REAR) |
| | H20-1709-14 | VINYL COVER |
| | H53-0003-14 | CARTON BOX |
| | J02-0363-04 | RUBBER FOOT,REAR |
| | J02-0525-13 | RUBBER FOOT,FRONT |
| | J02-0528-04 | TILT STAND |
| | J21-4704-04 | BRACKET,FOR POWER SWITCH |
| | J30-0633-04 | SPACER |
| | K01-0544-05 | HANDLE |
| | K21-0898-23 | KNOB,FREQUENCY |
| | K21-0908-04 | KNOB,SENSITIVITY/FINE |
| | K27-0504-04 | BUTTON;GRAY,USED 7 PIECES |
| | K27-0510-04 | BUTTON;GRAY,USED 6 PIECES |
| | K27-0559-04 | KNOB,ORANGE |
| | K27-0560-05 | KNOB,FOR ATT |
| | W02-2081-08 | MAIN UNIT |
| | X67-1040-00 | ACCESSORY COAD(CA-46) |
| C101 | C91-1367-08 | CAP. POLYESTER 1U 10% 200V |
| E1 | E21-0672-03 | TERMINAL,WHITE |
| E2 | E21-0671-03 | TERMINAL,BLACK |
| E3 | E21-0672-03 | TERMINAL,WHITE |
| E4 | E21-0671-03 | TERMINAL,BLACK |
| E5 | E21-0672-03 | TERMINAL,WHITE |
| M1 | B31-0764-08 | METER |
| P1 | E40-7133-08 | SOCKET 12P |
| P2 | E40-7131-08 | SOCKET 3P |
| P3 | E40-7131-08 | SOCKET 3P |
| P4 | E40-7132-08 | SOCKET 6P |
| P5 | E40-7131-08 | SOCKET 3P |
| P6 | E40-7132-08 | SOCKET 6P |
| P7 | E40-7132-08 | SOCKET 6P |
| P8 | E40-7131-08 | SOCKET 3P |
| P9 | E40-7131-08 | SOCKET 3P |
| P10 | E40-7131-08 | SOCKET 3P |
| P11 | E40-7131-08 | SOCKET 3P |
| P12 | E40-7131-08 | SOCKET 3P |
| P13 | E40-7131-08 | SOCKET 3P |
| P14 | E40-7132-08 | SOCKET 6P |
| P15 | E40-7131-08 | SOCKET 3P |
| P16 | E40-7131-08 | SOCKET 3P |
| P17 | E40-7131-08 | SOCKET 3P |
| P18 | E40-7132-08 | SOCKET 6P |
| P19 | E40-7132-08 | SOCKET 6P |
| P20 | E40-7131-08 | SOCKET 3P |
| P21 | E40-7131-08 | SOCKET 3P |
| R101 | R29-5501-08 | V.R. |
| R102 | RN14BK2E2671F | RES. METAL FILM 2.67K 1% 1/4W |
| R110 | R29-1505-08 | V.R. |
| R111 | R29-4501-08 | V.R. |
| S1 | S33-2511-08 | LEVER SWITCH |
| S4 | S40-2534-08 | PUSH SWITCH,POWER |
| T1 | L01-9955-08 | POWER TRANSFORMER |

## MAIN UNIT

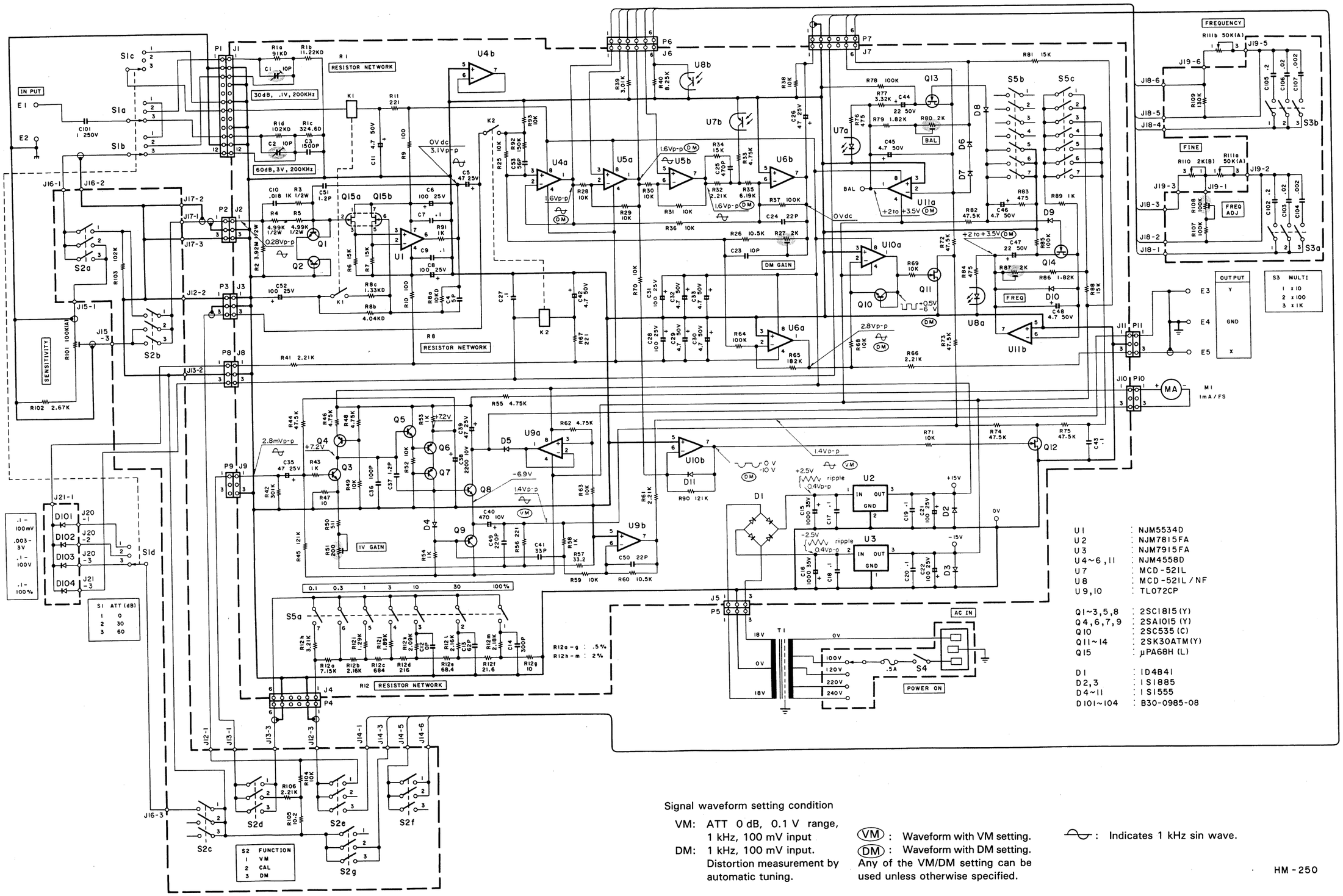
### W02-2081-08

| REF.NO | PARTS NO | NAME & DESCRIPTION |
|---|---|---|
| | E21-0675-08 | TERMINAL(0V,+15V,-15V,BAL) |
| | F01-0887-08 | HEAT SINK |
| | F10-1639-08 | SHIELD PLATE |
| | F10-1640-08 | SHIELD PLATE,6X55MM |
| | F10-1641-08 | SHIELD PLATE,20X35MM |
| | J73-0040-08 | PCB (UNMOUNTED) |
| | R92-0150-05 | JUMPING RES. ZERO OHM(10MM) |
| | T30-0636-08 | SPACER,FOR LED |
| C1 | C05-0479-08 | CAP. TRIMMER 10P |
| C2 | C05-0479-08 | CAP. TRIMMER 10P |
| C3 | CC45CH1H152J | CAP. CERAMIC 1500P 5% 50V |
| C4 | CC45CH1H050D | CAP. CERAMIC 5P 0.5P 50V |
| C5 | C90-3073-08 | CAP. ELECTRO 47 105°C 25V |
| C6 | C90-3074-08 | CAP. ELECTRO 100 105°C 25V |
| C7 | C91-1368-08 | CAP. CERAMIC 0.1 80/-20% 50V |
| C8 | C90-3074-08 | CAP. ELECTRO 100 105°C 25V |
| C9 | C91-1368-08 | CAP. CERAMIC 0.1 80/-20% 50V |
| C10 | C91-1366-08 | CAP. POLYESTER 0.018 5% 250V |
| C11 | C90-3076-08 | CAP. ELECTRO 4.7 105°C 50V |
| C12 | NO USE | |
| C13 | CC45CH1H620J | CAP. CERAMIC 62P 5% 50V |
| C14 | CC45CH1H301J | CAP. CERAMIC 300P 5% 50V |
| C15 | C90-3075-08 | CAP. ELECTRO 1000 105°C 35V |
| C16 | C90-3075-08 | CAP. ELECTRO 1000 105°C 35V |
| C17 | C91-1368-08 | CAP. CERAMIC 0.1 80/-20% 50V |
| C18 | C91-1368-08 | CAP. CERAMIC 0.1 80/-20% 50V |
| C19 | C91-1368-08 | CAP. CERAMIC 0.1 80/-20% 50V |
| C20 | C91-1368-08 | CAP. CERAMIC 0.1 80/-20% 50V |
| C21 | C90-3074-08 | CAP. ELECTRO 100 105°C 25V |
| C22 | C90-3074-08 | CAP. ELECTRO 100 105°C 25V |
| C23 | CC45CH1H100D | CAP. CERAMIC 10P 0.5P 50V |
| C24 | CC45CH1H220J | CAP. CERAMIC 22P 5% 50V |
| C25 | CC45CH1H471J | CAP. CERAMIC 470P 5% 50V |
| C26 | C90-3073-08 | CAP. ELECTRO 47 105°C 25V |
| C27 | C91-1368-08 | CAP. CERAMIC 0.1 80/-20% 50V |
| C28 | C90-3074-08 | CAP. ELECTRO 100 105°C 25V |
| C29 | C90-3076-08 | CAP. ELECTRO 4.7 105°C 50V |
| C30 | C90-3076-08 | CAP. ELECTRO 4.7 105°C 50V |
| C31 | C90-3074-08 | CAP. ELECTRO 100 105°C 25V |
| C32 | C90-3076-08 | CAP. ELECTRO 4.7 105°C 50V |
| C33 | C90-3076-08 | CAP. ELECTRO 4.7 105°C 50V |
| C34 | NO USE | |
| C35 | C90-3073-08 | CAP. ELECTRO 47 105°C 25V |
| C36 | CC45CH1H101J | CAP. CERAMIC 100P 5% 50V |
| C37 | CC45CH1H1R2M | CAP. CERAMIC 1.2P 20% 50V |
| C38 | C90-3072-08 | CAP. ELECTRO 2200 105°C 10V |
| C39 | C90-3073-08 | CAP. ELECTRO 47 105°C 25V |
| C40 | C90-3071-08 | CAP. ELECTRO 470 105°C 10V |
| C41 | CC45CH1H330J | CAP. CERAMIC 33P 5% 50V |
| C42 | C90-3076-08 | CAP. ELECTRO 4.7 105°C 50V |
| C43 | C91-1368-08 | CAP. CERAMIC 0.1 80/-20% 50V |
| C44 | C90-3077-08 | CAP. ELECTRO 22 105°C 50V |
| C45 | C90-3076-08 | CAP. ELECTRO 4.7 105°C 50V |
| C46 | C90-3076-08 | CAP. ELECTRO 4.7 105°C 50V |
| C47 | C90-3077-08 | CAP. ELECTRO 22 105°C 50V |
| C48 | C90-3076-08 | CAP. ELECTRO 4.7 105°C 50V |
| C49 | CC45CH1H221J | CAP. CERAMIC 220P 5% 50V |
| C50 | CC45CH1H220J | CAP. CERAMIC 22P 5% 50V |
| C51 | CC45CH1H1R2M | CAP. CERAMIC 1.2P 20% 50V |
| C52 | C90-3074-08 | CAP. ELECTRO 100 105°C 25V |
| C53 | CC45CH1H560J | CAP. CERAMIC 56P 5% 50V |
| C102 | C91-1363-08 | CAP. CERAMIC 0.2UF 1% 50V |
| C103 | C91-1364-08 | CAP. CERAMIC 0.02UF 1% 50V |
| C104 | C91-1365-08 | CAP. CERAMIC 0.002UF 1% 50V |
| C105 | C91-1363-08 | CAP. CERAMIC 0.2UF 1% 50V |
| C106 | C91-1364-08 | CAP. CERAMIC 0.02UF 1% 50V |
| C107 | C91-1365-08 | CAP. CERAMIC 0.002UF 1% 50V |
| D1 | 1D4B41 | DIODE,STACK |
| D2 | 1S1885 | DIODE |
| D3 | 1S1885 | DIODE |
| D4 | 1S1555 | DIODE |
| D5 | 1S1555 | DIODE |
| D6 | 1S1555 | DIODE |
| D7 | 1S1555 | DIODE |
| D8 | 1S1555 | DIODE |
| D9 | 1S1555 | DIODE |
| D10 | 1S1555 | DIODE |
| D11 | 1S1555 | DIODE |
| D101 | B30-0985-08 | LED,RED |
| D102 | B30-0985-08 | LED,RED |
| D103 | B30-0985-08 | LED,RED |
| D104 | B30-0985-08 | LED,RED |

# PARTS LIST

| REF.NO | PARTS NO | NAME & DESCRIPTION |
|---|---|---|
| J1 | E40-7139-08 | PIN CONNECTOR 12P |
| J2 | E40-7134-08 | PIN CONNECTOR 3P |
| J3 | E40-7134-08 | PIN CONNECTOR 3P |
| J4 | E40-7135-08 | PIN CONNECTOR 6P |
| J5 | E40-7134-08 | PIN CONNECTOR 3P |
| J6 | E40-7135-08 | PIN CONNECTOR 6P |
| J7 | E40-7135-08 | PIN CONNECTOR 6P |
| J8 | E40-7134-08 | PIN CONNECTOR 3P |
| J9 | E40-7134-08 | PIN CONNECTOR 3P |
| J10 | E40-7134-08 | PIN CONNECTOR 3P |
| J11 | E40-7134-08 | PIN CONNECTOR 3P |
| J12 | E40-7134-08 | PIN CONNECTOR 3P |
| J13 | E40-7134-08 | PIN CONNECTOR 3P |
| J14 | E40-7135-08 | PIN CONNECTOR 6P |
| J15 | E40-7134-08 | PIN CONNECTOR 3P |
| J16 | E40-7134-08 | PIN CONNECTOR 3P |
| J17 | E40-7134-08 | PIN CONNECTOR 3P |
| J18 | E40-7135-08 | PIN CONNECTOR 6P |
| J19 | E40-7135-08 | PIN CONNECTOR 6P |
| J20 | E40-7134-08 | PIN CONNECTOR 3P |
| J21 | E40-7134-08 | PIN CONNECTOR 3P |
| K1 | S51-1531-08 | RELAY |
| K2 | S51-1531-08 | RELAY |
| Q1 | 2SC1815(Y) | TR. SI, NPN |
| Q2 | 2SC1815(Y) | TR. SI, NPN |
| Q3 | 2SC1815(Y) | TR. SI, NPN |
| Q4 | 2SA1015(Y) | TR. SI, PNP |
| Q5 | 2SC1815(Y) | TR. SI, NPN |
| Q6 | 2SA1015(Y) | TR. SI, PNP |
| Q7 | 2SA1015(Y) | TR. SI, PNP |
| Q8 | 2SC1815(Y) | TR. SI, NPN |
| Q9 | 2SA1015(Y) | TR. SI, PNP |
| Q10 | 2SC535(C) | TR. SI, NPN |
| Q11 | 2SK30ATM(Y) | FET, N-CHANNEL |
| Q12 | 2SK30ATM(Y) | FET, N-CHANNEL |
| Q13 | 2SK30ATM(Y) | FET, N-CHANNEL |
| Q14 | 2SK30ATM(Y) | FET, N-CHANNEL |
| Q15 | UPA68H(L) | FET, N-CHANNEL DUAL |
| R1 | R90-0700-08 | RES. NETWORK |
| R2 | RN14BE2H3924F | RES. METAL FILM 3.92M 1% 1/2W |
| R3 | RN14BE2H1001F | RES. METAL FILM 1K 1% 1/2W |
| R4 | RN14BE2H4991F | RES. METAL FILM 4.99K 1% 1/2W |
| R5 | RN14BE2H4991F | RES. METAL FILM 4.99K 1% 1/2W |
| R6 | RN14BK2E1502F | RES. METAL FILM 15K 1% 1/4W |
| R7 | RN14BK2E1502F | RES. METAL FILM 15K 1% 1/4W |
| R8 | R90-1102-08 | RES. NETWORK 10K,4.04K,33K |
| R9 | RN14BK2E1000F | RES. METAL FILM 100 1% 1/4W |
| R10 | RN14BK2E1000F | RES. METAL FILM 100 1% 1/4W |
| R11 | RN14BK2E2210F | RES. METAL FILM 221 1% 1/4W |
| R12 | R90-1101-08 | RES. NETWORK |
| R25 | RN14BK2E1002F | RES. METAL FILM 10K 1% 1/4W |
| R26 | RN14BK2E1052F | RES. METAL FILM 10.5K 1% 1/4W |
| R27 | R12-1559-08 | RES. SEMI FIXED 2KB |
| R28 | RN14BK2E1002F | RES. METAL FILM 10K 1% 1/4W |
| R29 | RN14BK2E1002F | RES. METAL FILM 10K 1% 1/4W |
| R30 | RN14BK2E1002F | RES. METAL FILM 10K 1% 1/4W |
| R31 | RN14BK2E1002F | RES. METAL FILM 10K 1% 1/4W |
| R32 | RN14BK2E2211F | RES. METAL FILM 2.21K 1% 1/4W |
| R33 | RN14BK2E4751F | RES. METAL FILM 4.75K 1% 1/4W |
| R34 | RN14BK2E1502F | RES. METAL FILM 15K 1% 1/4W |
| R35 | RN14BK2E6191F | RES. METAL FILM 6.19K 1% 1/4W |
| R36 | RN14BK2E1002F | RES. METAL FILM 10K 1% 1/4W |
| R37 | RN14BK2E1003F | RES. METAL FILM 100K 1% 1/4W |
| R38 | RN14BK2E1002F | RES. METAL FILM 10K 1% 1/4W |
| R39 | RN14BK2E3011F | RES. METAL FILM 3.01K 1% 1/4W |
| R40 | RN14BK2E8251F | RES. METAL FILM 8.25K 1% 1/4W |
| R41 | RN14BK2E2211F | RES. METAL FILM 2.21K 1% 1/4W |
| R42 | RN14BK2E3013F | RES. METAL FILM 301K 1% 1/4W |
| R43 | RN14BK2E1001F | RES. METAL FILM 1K 1% 1/4W |
| R44 | RN14BK2E4752F | RES. METAL FILM 47.5K 1% 1/4W |
| R45 | RN14BK2E1213F | RES. METAL FILM 121K 1% 1/4W |
| R46 | RN14BK2E4751F | RES. METAL FILM 4.75K 1% 1/4W |
| R47 | RN14BK2E10R0F | RES. METAL FILM 10 1% 1/4W |
| R48 | RN14BK2E4751F | RES. METAL FILM 4.75K 1% 1/4W |
| R49 | RN14BK2E1002F | RES. METAL FILM 10K 1% 1/4W |
| R50 | RN14BK2E5110F | RES. METAL FILM 511 1% 1/4W |
| R51 | R12-0594-08 | RES. SEMI FIXED 200 B |
| R52 | RN14BK2E1002F | RES. METAL FILM 10K 1% 1/4W |
| R53 | RN14BK2E1001F | RES. METAL FILM 1K 1% 1/4W |
| R54 | RN14BK2E1001F | RES. METAL FILM 1K 1% 1/4W |
| R55 | RN14BK2E4751F | RES. METAL FILM 4.75K 1% 1/4W |
| R56 | RN14BK2E2210F | RES. METAL FILM 221 1% 1/4W |
| R57 | RN14BK2E33R2F | RES. METAL FILM 33.2 1% 1/4W |
| R58 | RN14BK2E1001F | RES. METAL FILM 1K 1% 1/4W |
| R59 | RN14BK2E1002F | RES. METAL FILM 10K 1% 1/4W |
| R60 | RN14BK2E1052F | RES. METAL FILM 10.5K 1% 1/4W |
| R61 | RN14BK2E2211F | RES. METAL FILM 2.21K 1% 1/4W |
| R62 | RN14BK2E4751F | RES. METAL FILM 4.75K 1% 1/4W |
| R63 | RN14BK2E1002F | RES. METAL FILM 10K 1% 1/4W |
| R64 | RN14BK2E1003F | RES. METAL FILM 100K 1% 1/4W |
| R65 | RN14BK2E1823F | RES. METAL FILM 182K 1% 1/4W |
| R66 | RN14BK2E2211F | RES. METAL FILM 2.21K 1% 1/4W |
| R67 | RN14BK2E2210F | RES. METAL FILM 221 1% 1/4W |
| R68 | RN14BK2E1002F | RES. METAL FILM 10K 1% 1/4W |
| R69 | RN14BK2E1002F | RES. METAL FILM 10K 1% 1/4W |
| R70 | RN14BK2E1002F | RES. METAL FILM 10K 1% 1/4W |
| R71 | RN14BK2E1002F | RES. METAL FILM 10K 1% 1/4W |
| R72 | RN14BK2E4752F | RES. METAL FILM 47.5K 1% 1/4W |
| R73 | RN14BK2E4752F | RES. METAL FILM 47.5K 1% 1/4W |
| R74 | RN14BK2E4752F | RES. METAL FILM 47.5K 1% 1/4W |
| R75 | RN14BK2E4752F | RES. METAL FILM 47.5K 1% 1/4W |
| R76 | RN14BK2E4750F | RES. METAL FILM 475 1% 1/4W |
| R77 | RN14BK2E3321F | RES. METAL FILM 3.32K 1% 1/4W |
| R78 | RN14BK2E1003F | RES. METAL FILM 100K 1% 1/4W |
| R79 | RN14BK2E1821F | RES. METAL FILM 1.82K 1% 1/4W |
| R80 | R12-1559-08 | RES. SEMI FIXED 2KB |
| R81 | RN14BK2E1502F | RES. METAL FILM 15K 1% 1/4W |
| R82 | RN14BK2E4752F | RES. METAL FILM 47.5K 1% 1/4W |
| R83 | RN14BK2E4750F | RES. METAL FILM 475 1% 1/4W |
| R84 | RN14BK2E4750F | RES. METAL FILM 475 1% 1/4W |
| R85 | RN14BK2E1003F | RES. METAL FILM 100K 1% 1/4W |
| R86 | RN14BK2E1821F | RES. METAL FILM 1.82K 1% 1/4W |
| R87 | R12-1559-08 | RES. SEMI FIXED 2KB |
| R88 | RN14BK2E1502F | RES. METAL FILM 15K 1% 1/4W |
| R89 | RN14BK2E1001F | RES. METAL FILM 1K 1% 1/4W |
| R90 | RN14BK2E1213F | RES. METAL FILM 121K 1% 1/4W |
| R91 | RN14BK2E1001F | RES. METAL FILM 1K 1% 1/4W |
| R92 | RN14BK2E1503F | RES. METAL FILM 150K 1% 1/4W |
| R93 | RN14BK2E1002F | RES. METAL FILM 10K 1% 1/4W |
| R103 | RN14BK2E1023F | RES. METAL FILM 102K 1% 1/4W |
| R104 | RN14BK2E1002F | RES. METAL FILM 10K 1% 1/4W |
| R105 | RN14BK2E10R2F | RES. METAL FILM 10.2 1% 1/4W |
| R106 | RN14BK2E2211F | RES. METAL FILM 2.21K 1% 1/4W |
| R107 | RN14BK2E1003F | RES. METAL FILM 100K 1% 1/4W |
| R108 | R12-5544-08 | RES. SEMI FIXED 100KB |
| R109 | RN14BK2E1303F | RES. METAL FILM 130K 1% 1/4W |
| S2 | S42-3519-08 | PUSH SWITCH |
| S3 | S42-3520-08 | PUSH SWITCH |
| S4 | NO USE | |
| S5 | S42-3521-08 | PUSH SWITCH |
| U1 | NJM5534D | IC,OP AMP |
| U2 | NJM7815FA | IC,3-TERMINAL REGULATOR |
| U3 | NJM7915FA | IC,3-TERMINAL REGULATOR |
| U4 | NJM4558D | IC,DUAL OP AMP |
| U5 | NJM4558D | IC,DUAL OP AMP |
| U6 | NJM4558D | IC,DUAL OP AMP |
| U7 | MCD-521L | IC,PHOTO COUPLER |
| U8 | MCD-521L/NF | IC,PHOTO COUPLER |
| U9 | TL072CP | IC,JFET-INPUT OP AMP |
| U10 | TL072CP | IC,JFET-INPUT OP AMP |
| U11 | NJM4558D | IC,DUAL OP AMP |

# SCHEMATIC DIAGRAM




| | |
|---|---|
| U1 | NJM5534D |
| U2 | NJM7815FA |
| U3 | NJM7915FA |
| U4~6,11 | NJM4558D |
| U7 | MCD-521L |
| U8 | MCD-521L/NF |
| U9,10 | TL072CP |
| Q1~3,5,8 | 2SC1815(Y) |
| Q4,6,7,9 | 2SA1015(Y) |
| Q10 | 2SC535(C) |
| Q11~14 | 2SK30ATM(Y) |
| Q15 | μPA68H(L) |
| D1 | 1D4841 |
| D2,3 | 1S1885 |
| D4~11 | 1S1555 |
| D101~104 | B30-0985-08 |

Signal waveform setting condition

VM: ATT 0 dB, 0.1 V range, 1 kHz, 100 mV input

DM: 1 kHz, 100 mV input. Distortion measurement by automatic tuning.

(VM) : Waveform with VM setting.

(DM) : Waveform with DM setting.

Any of the VM/DM setting can be used unless otherwise specified.

~ : Indicates 1 kHz sin wave.

HM-250

# P.C. BOARD

## MAIN UNIT (W02-2081-08)